

(12) UK Patent Application (19) GB (11) 2 303 956 (13) A

(43) Date of A Publication 05.03.1997

(21) Application No 9615999.1

(22) Date of Filing 30.07.1996

(30) Priority Data

(31) 07197573 (32) 02.08.1995 (33) JP

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(51) INT CL⁶

G07F 7/08 // G07B 15/00

(52) UK CL (Edition O)

G4T TAX TBX
G4V VAK V128

(56) Documents Cited

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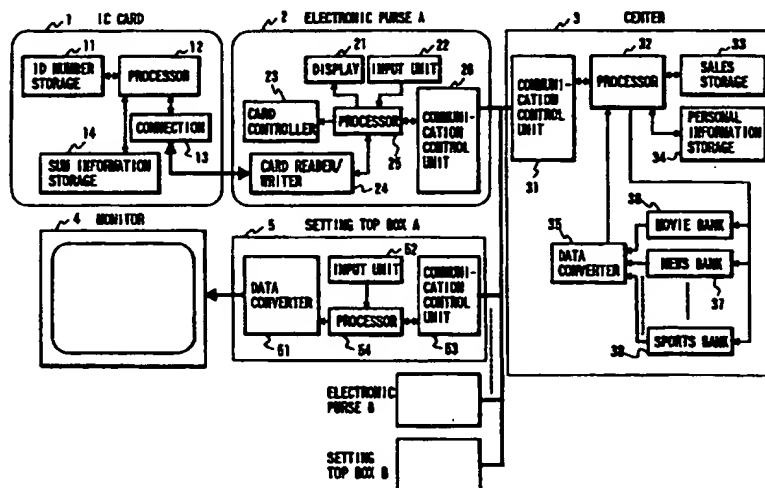
(58) Field of Search

UK CL (Edition O) G4T TAE TAX TBA TBX , G4V VAK
INT CL⁶ G07B 15/00 15/02 , G07F 7/08
ONLINE:WPI

(54) Electronic purse loan system

(57) The sum of the former loan of the user of an IC card is written to a personal information storage provided at a center and when the IC card is inserted into the slot of an electronic purse terminal at the time of the next transaction, the sum of the loan stored in the personal information storage is cleared and this loan is paid. At this time, the sum stored in the sum information storage of the IC card is updated by this payment and is stored as the balance in the sum information storage. If the balance is more than the charge for a transaction, the transaction is effected and if the balance is less than the charge for the transaction, the transaction is performed by having a new loan. The sum of this loan is stored in the personal information storage in the center. As described above, the suspension of a transaction due to the shortage of a balance can be avoided by providing a function for loan to an electronic purse system. The system may be used in paying for hire of films, payment for goods at a POS terminal, or payment of fares.

FIG. 1



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FIG. 1

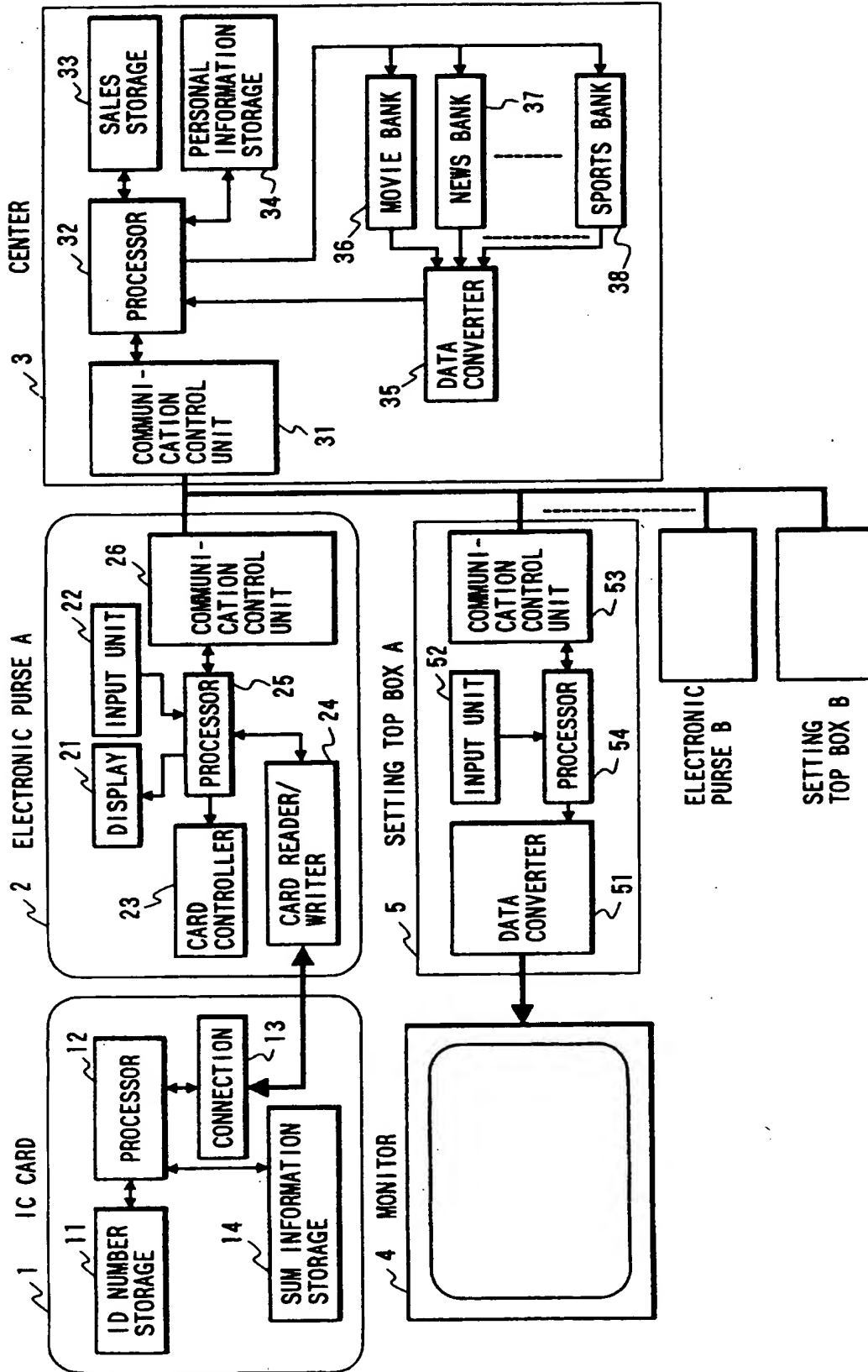


FIG. 2(b)

Diagram 34 illustrates a table structure for recording loan information. The table is divided into three main columns: 'ID NUMBER' (labeled 60), 'SUM' (labeled 61), and 'DATE' (labeled 62). The 'ID NUMBER' column contains a vertical dashed line, indicating a placeholder for an identifier. The 'SUM' and 'DATE' columns are empty, representing fields for recording the loan amount and the date of the transaction, respectively.

FIG. 3

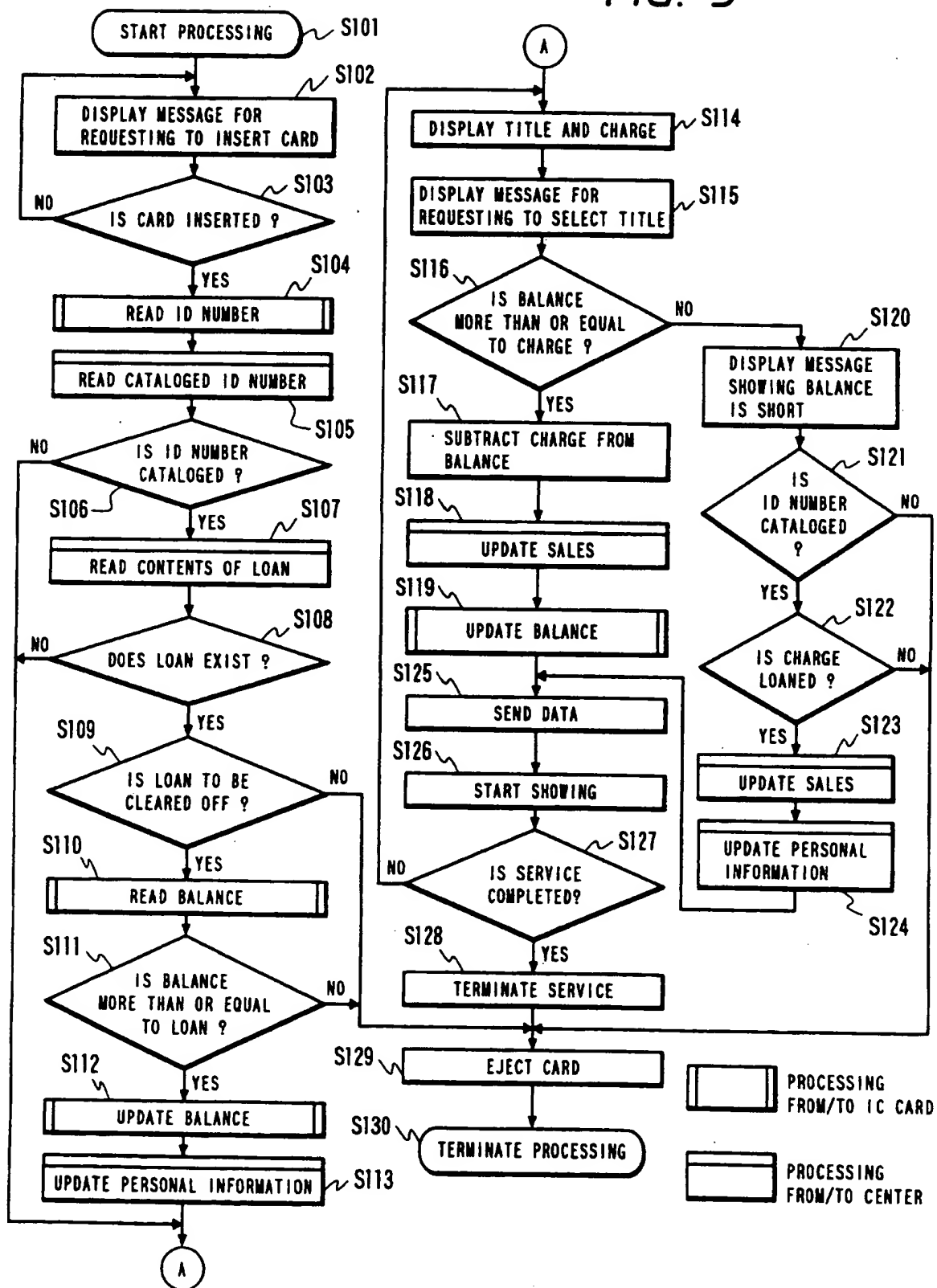


FIG. 4

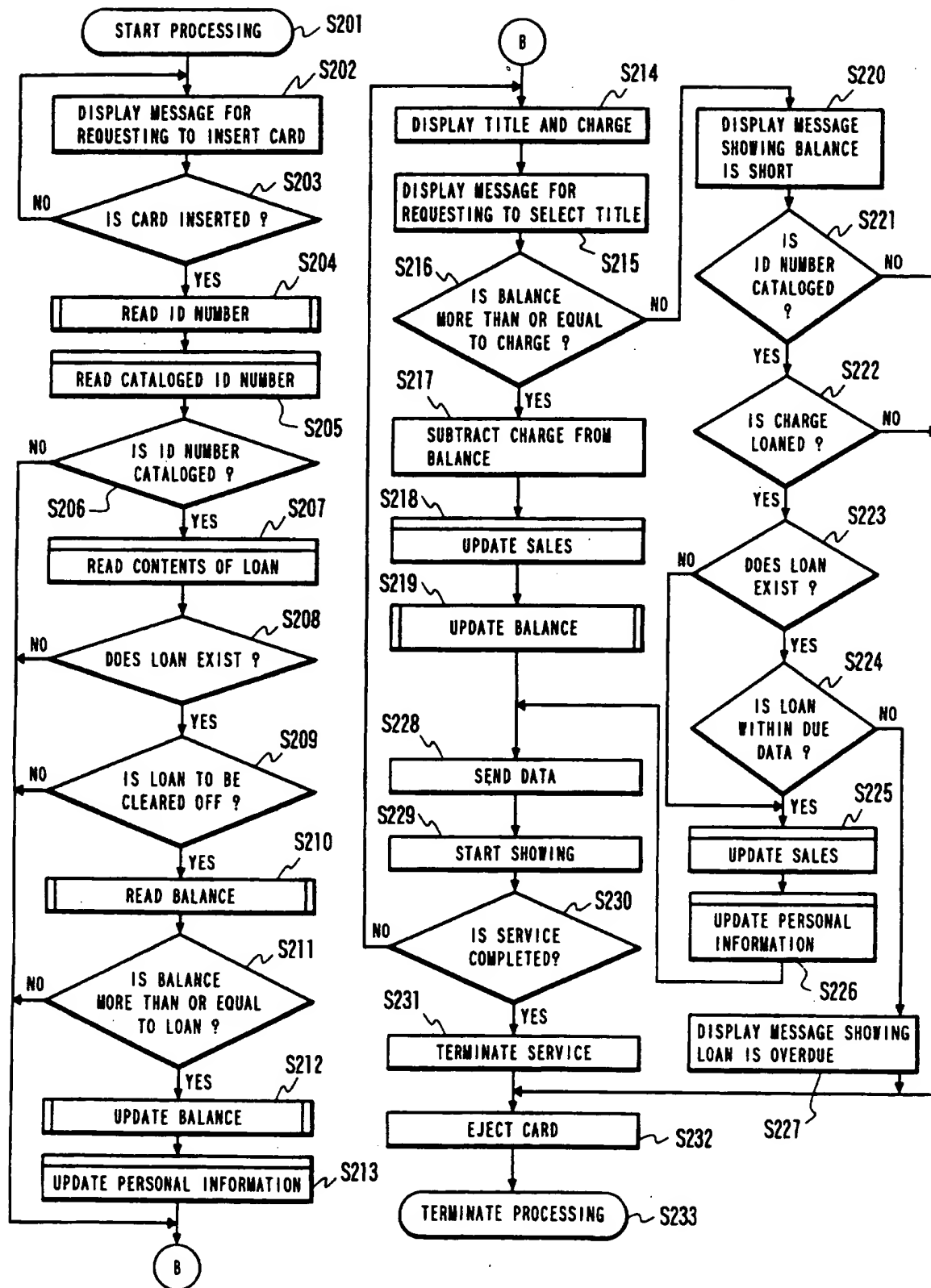


FIG. 5

ID NUMBER	CONTENTS OF LOAN		
	MAXIMUM SUM	SUM	DATE
⋮	⋮	⋮	⋮

FIG. 10

ID NUMBER	ENTRAINED STATION CODE	CONTENTS OF LOAN	
		SUM	DATE
⋮	⋮	⋮	⋮

FIG. 6

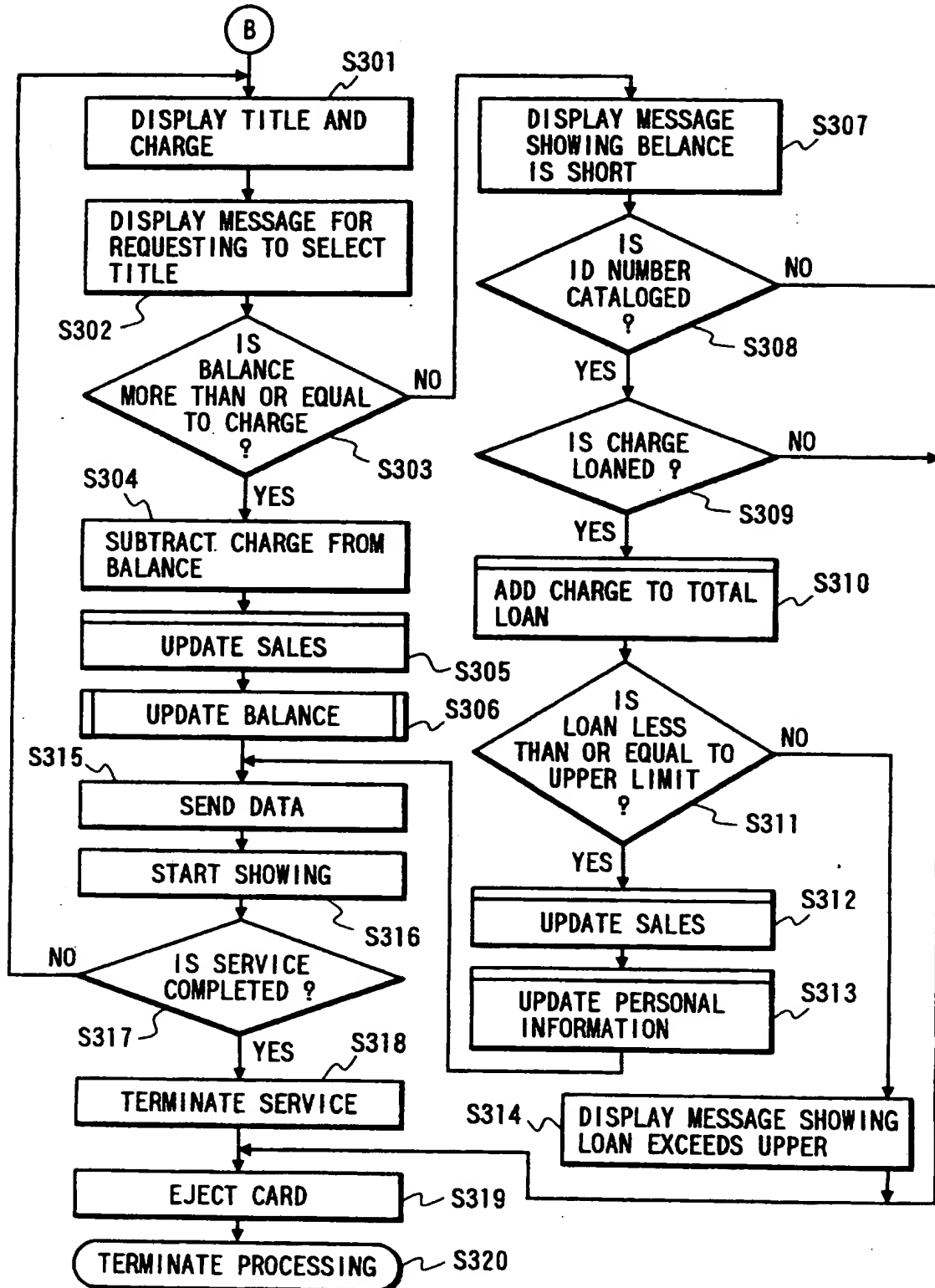
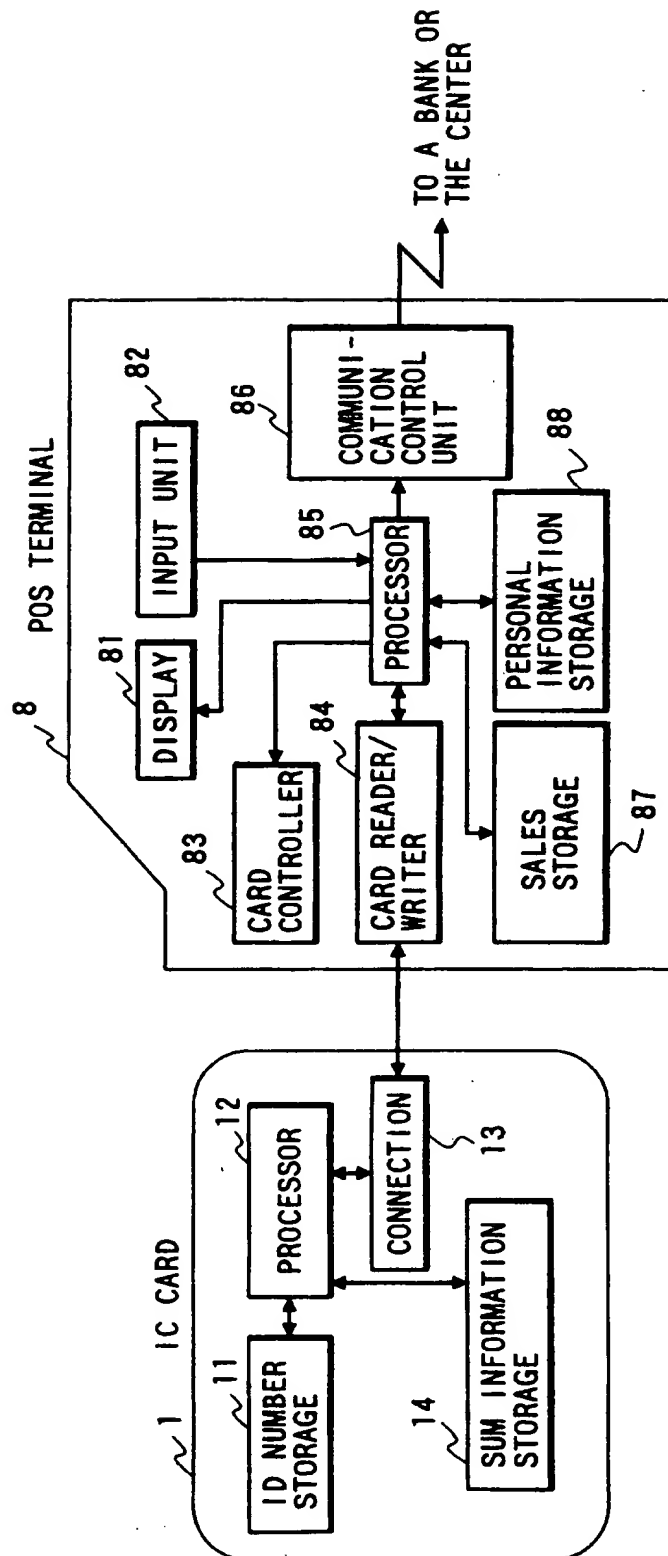


FIG. 7



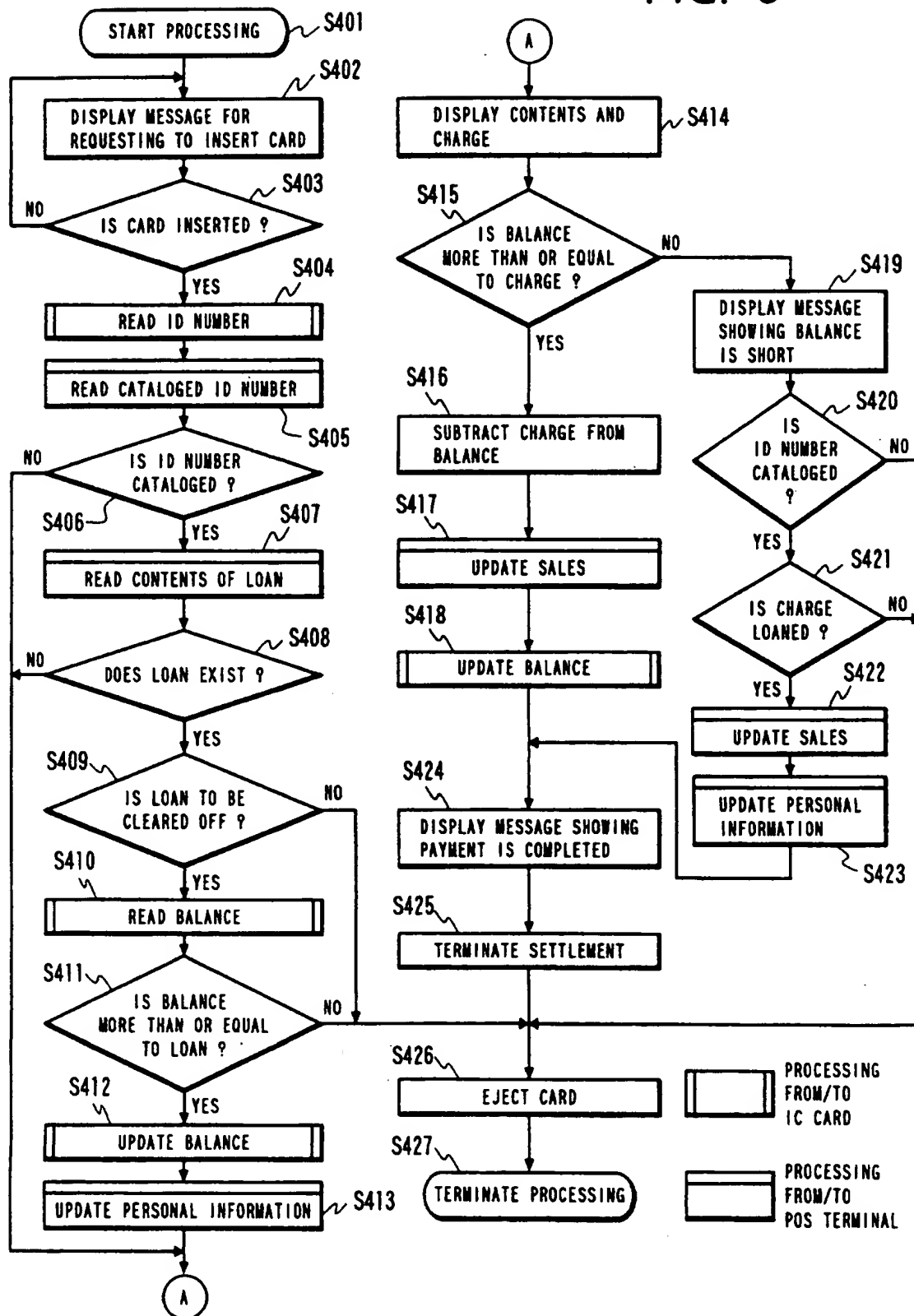


FIG. 9

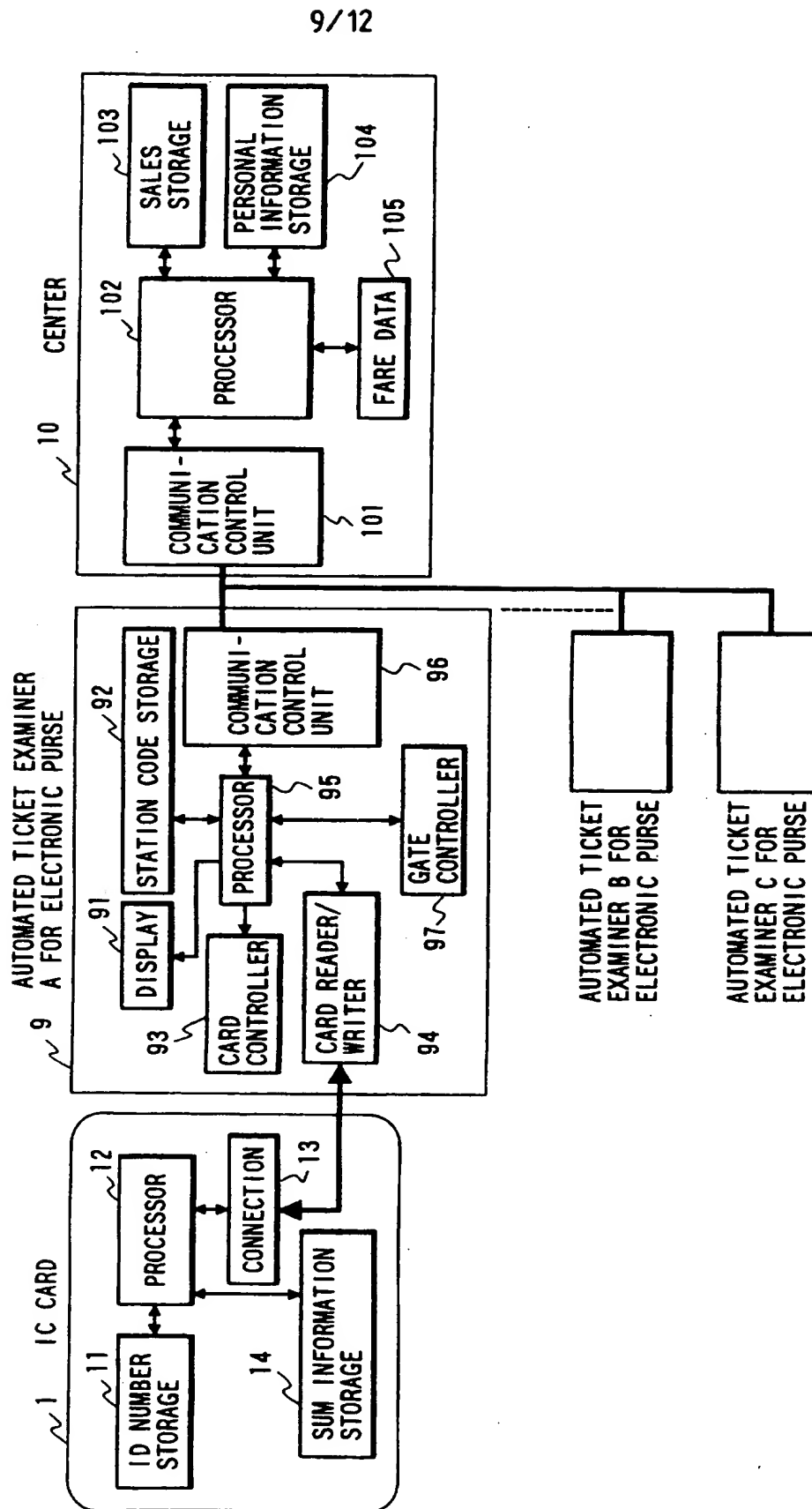


FIG. 11

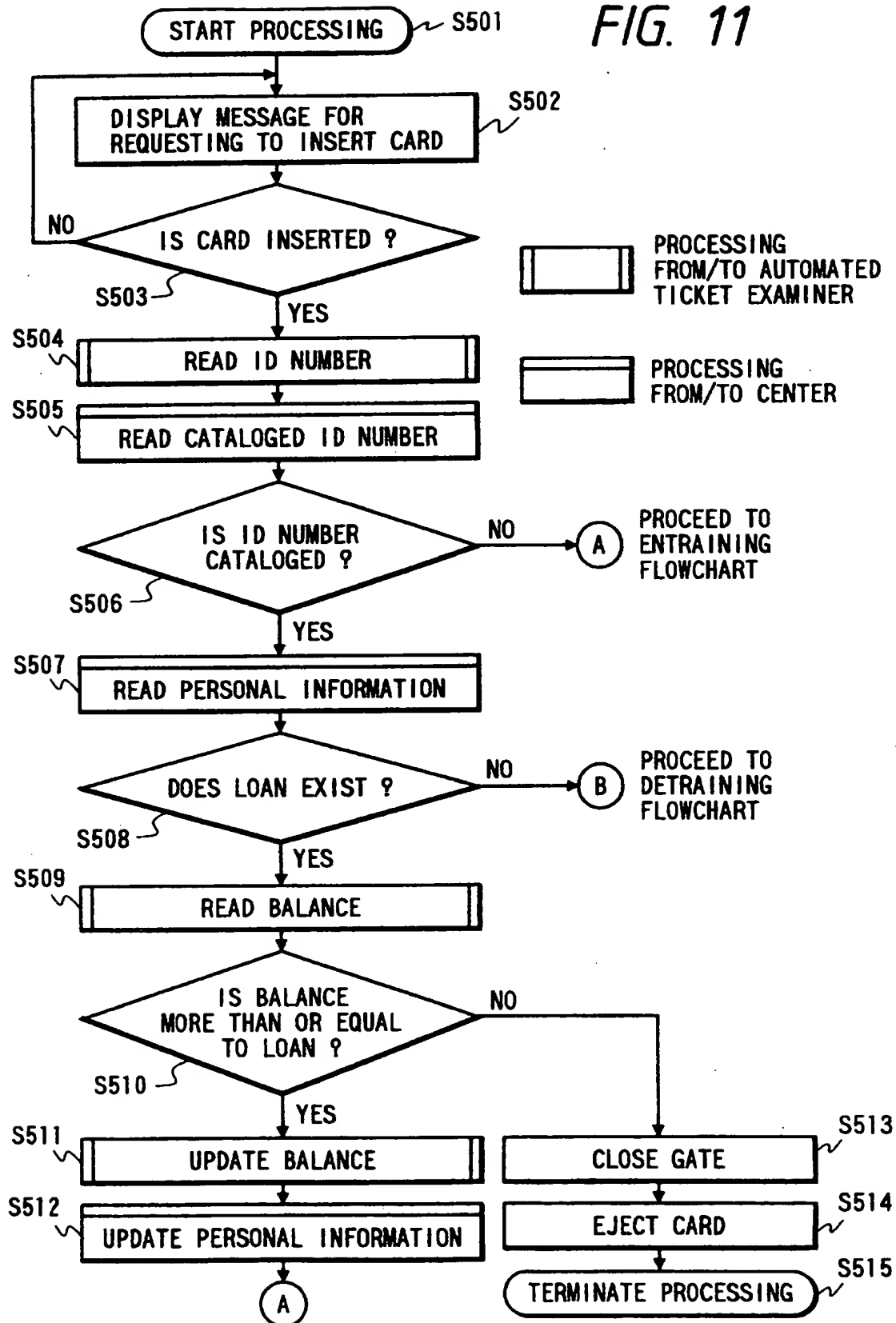


FIG. 12(a)

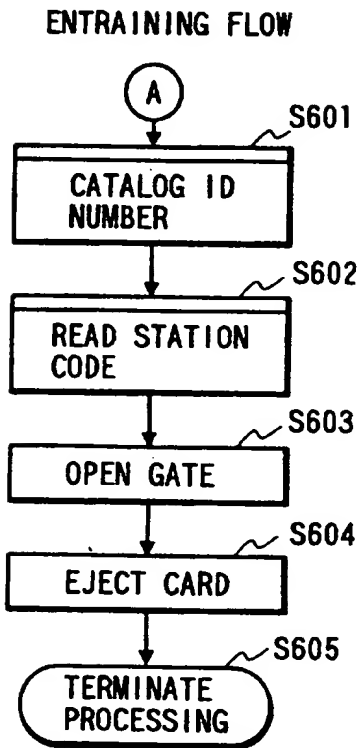


FIG. 12(b)

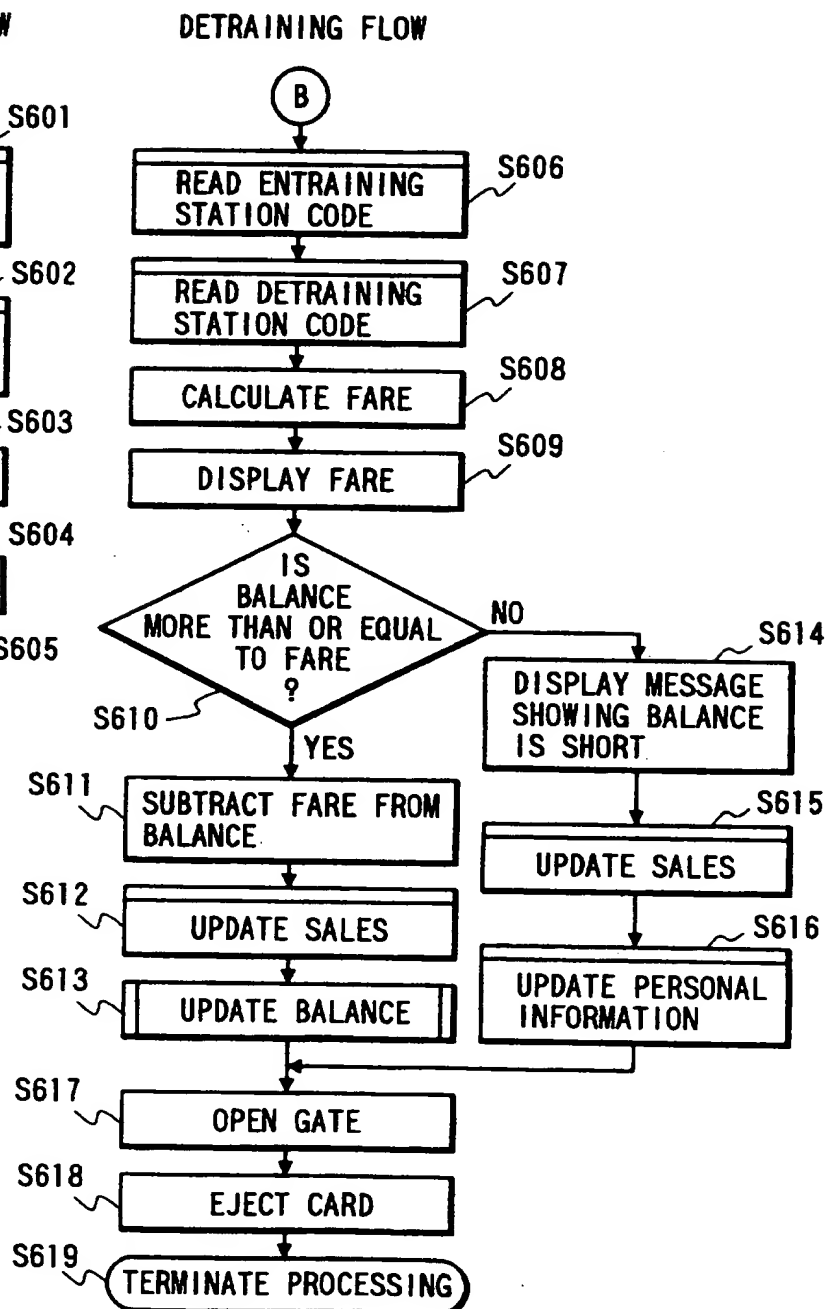
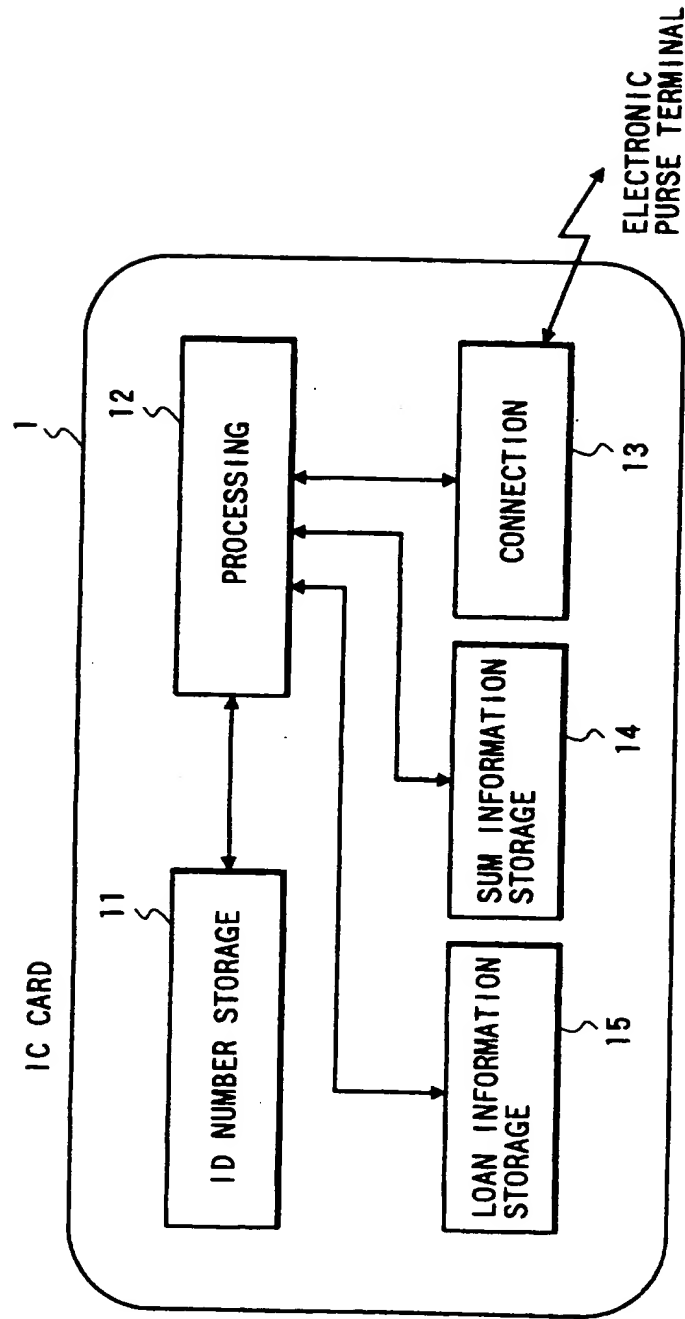


FIG. 13



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Electronic Purse Loan System

The present invention relates to an electronic purse loan system for storing the data of a short amount in a center and a POS terminal to clear off the short amount in the next transaction when a commercial transaction is performed using an electronic purse system.

If a commercial transaction is performed using a prepaid card widespread at present such as a telephone card, the above-described system stops a commercial transaction at that time when the total consumed amount reaches the sum stored in the card.

In the meantime, an electronic purse system in which a transaction is performed by recording the information of a consumed amount in an IC card and others is proposed, however, in such an electronic purse system, a transaction is performed only for the sum payable from an electronic purse as described in Japanese published unexamined patent application No. H3-92966. That is, if the balance stored in an IC card is less than the amount of a transaction, the user of an electronic purse is informed that the balance is short and is urged to judge whether the transaction is to be

stopped, the amount to be paid using an IC card is to be changed or another transaction method such as a credit card is to be used to perform flexible transaction of shopping.

As the above-described prepaid card is used only for payment for a specific service, a card for the amount of money corresponding to it is prepared beforehand. Therefore, there are few occasions on which a balance is short. However, in the above-described electronic purse system, there is a great possibility that the shortage of a balance at the time of payment due to forgetting to pay in a person's own electronic purse and the shortage of a paid amount occurs because an electronic purse is utilized in many fields. Therefore, in the electronic purse system, the balance in an IC card can be checked at any time by a portable balance display and others, however, if a balance is short at the time of a transaction, the transaction by an electronic purse is impossible.

The object of the present invention is to provide an electronic purse system in which a transaction is not stopped due to the shortage of a balance even if the user of the electronic purse system forgets to pay in his account for his own IC card or

even during a time sharing service. Another object of the present invention is to enable correspondence only by the electronic purse system without using another transaction method such as cash and a credit card as heretofore as a method of avoiding the suspension of a transaction.

To achieve the above-described objects, an electronic purse loan system according to the present invention comprises an IC card provided with an ID number for storing electronic money information, an IC card reading/writing means for reading information from the IC card or writing information to the IC card, an input means for inputting a numeric value, an electronic purse terminal provided with a communication control means for sending or receiving data via a public telephone network, a personal information storing means for storing the ID number of the IC card and the information of a sum, a collation means for collating with the ID number and the information of the sum stored in the personal information storing means, a data bank means for storing data such as a movie and an information center provided with a communication control means for sending or receiving data via the public telephone network.

If the sum stored in the electronic money information of an IC card is less than the charge of data when the data stored in the data bank means is read, the processing for loan is performed by storing the total or a part of the charge of the data in the personal information storing means as the information of a sum only if its ID number is verified by collating an ID number read from the IC card by the collation means and the user selects loan via the input means.

Therefore, if the shortage of a balance occurs at the time of payment using the electronic purse system, the processing for loan can be immediately performed by storing the sum of a loan in the center or a POS terminal as the information of a person the ID number whose is cataloged and the suspension of a transaction or the change to another transaction method such as cash and a credit card can be avoided. That is, heretofore, if the shortage of his balance occurs at the time of payment, a transaction is stopped or payment by another transaction method such as cash and a credit card is made, however, according to the present invention, the processing for loan can be immediately performed only by the electronic purse system by storing the information of the sum of a loan in the center or a POS terminal as the information of a person the ID

number whose is cataloged and adding a function for loan to the electronic purse system, the suspension of a transaction or the change to another transaction method can be avoided and a perfect cashless commercial transaction using only the electronic purse system by the user can be realized.

The present invention will be more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which;

Fig. 1 is a block diagram showing an embodiment of an electronic purse loan system according to the present invention. Fig. 2 shows a concrete example of a personal information storage in the electronic purse loan system shown in Fig. 1. Fig. 3 is a flowchart showing a concrete example of the basic operation in the electronic purse loan system shown in Fig. 1 and Fig. 4 is also a flowchart showing another concrete example of the basic operation in the electronic purse loan system shown in Fig. 1. Fig. 5 shows another concrete example of the personal information storage in the electronic purse loan system shown in Fig. 1. Fig. 6 is a flowchart showing further other concrete example of the basic operation in the electronic purse loan system shown in Fig. 1. Fig. 7 is a block diagram showing a

second embodiment of an electronic purse loan system according to the present invention. Fig. 8 is a flowchart showing a concrete example of the basic operation in the electronic purse loan system shown in Fig. 7. Fig. 9 is a block diagram showing a third embodiment of an electronic purse loan system according to the present invention. Fig. 10 shows a concrete example of a personal information storage in the electronic purse loan system shown in Fig. 9. Fig. 11 is a flowchart showing a concrete example of the basic operation in the electronic purse loan system shown in Fig. 9 and Fig. 12 is a flowchart showing the operation at the time of entraining and detraining in the flowchart shown in Fig. 11. Fig. 13 is a block diagram showing another concrete example of an IC card in the electronic purse loan system according to the present invention.

Embodiments according to the present invention will be described below referring to the drawings.

Fig. 1 is a block diagram showing a first embodiment of an electronic purse loan system according to the present invention, a reference number 1 denotes an IC card and 2 denotes an electronic purse terminal. A reference number 3 denotes a center, 4 denotes a

monitor, 5 denotes a setting top box, 11 denotes an ID number storage and 12 denotes a processor. A reference number 13 denotes a connection, 14 denotes a sum information storage, 21 denotes a display, 22 denotes an input unit and 23 denotes a card controller. A reference number 24 denotes a card reader/writer, 25 denotes a processor, 26 denotes a communication control unit and 31 denotes a communication control unit. A reference number 32 denotes a processor, 33 denotes a sales storage, 34 denotes a personal information storage and 35 denotes a data converter. A reference number 36 denotes a movie bank, 37 denotes a news bank and 38 denotes a sports bank. A reference number 51 denotes a data converter, 52 denotes a setting top box input unit, 53 denotes a communication control unit and 54 denotes a processor.

Fig. 2 shows a concrete example of the personal information storage 34 shown in Fig. 1. A reference number 60 denotes an ID number storage, 61 denotes a loan storage and 62 denotes a loaned date storage. A concrete example shown in Fig. 2 (a) shows a case that loan is given one ID number and a concrete example shown in Fig. 2 (b) shows a case that loan is given a plurality of ID numbers. The latter is for a group such as a family.

Fig. 3 is a flowchart showing a concrete example of the basic processing of this embodiment.

In this embodiment, service data such as a movie, news and sports is read from the center via a telecommunication line such as a public telephone network and the charge is paid using an electronic purse system.

The constitution and the processing shown in Figs. 1 and 3 premise that the owner of an IC card 1 should pay for the charge of a movie by electronic money, the system in this embodiment is placed in the wait state for the input of an IC card 1 until an IC card 1 is inserted into the slot of the electronic purse terminal 2 and a message to that effect is displayed on the display 21 of the electronic purse terminal 2 as a result of the processing in a step S102.

When the user inserts his/her IC card into the slot of the electronic purse terminal 2, the IC card is inserted by the card controller 23 of the electronic purse terminal 2, the connection 13 of the IC card 1 is connected to the card reader/writer 24 of the electronic purse terminal 2 and the electronic purse terminal 2 verifies the IC card 1 is inserted in a step S103.

When it is verified that the IC card 1 is inserted, it is first checked whether the owner of the

IC card 1 is the cataloged member of the center 3 or not. For that purpose, an ID number proper to the IC card stored in the ID number storage 11 of the IC card 1 is read by the card reader/writer 24 in the electronic purse terminal 2 in a step S104 and after it is processed in the processor 25, it is supplied to the processor 32 of the center 3 via the communication control unit 26 of the electronic purse terminal 2 and the communication control unit 31 of the center 3. The cataloged ID number is read from the ID number storage 60 shown in Fig. 2 in the personal information storage 34 in the center 3 in a step S105 and the ID number stored in the IC card 1 is collated with this cataloged ID number to check whether the ID number stored in the IC card 1 is cataloged in the center 3 or not in a step S106. When it is verified that the ID number stored in the IC card is a cataloged member hereby, a function for loan is usable, however, if the ID number stored in the IC card is not a cataloged member, the function for loan cannot be used, only a normal transaction by electronic money is allowed and processing proceeds to a step S114.

If the function for loan of the center 3 pays the charge of the last service on the behalf of the cataloged member, the member cannot receive next service while no charge of the last service is cleared off by

the member. Therefore, the contents of the information of the member stored in the personal information storage 34 in the center 3 are referred in a step S107 and it is checked whether a loan exists in the last transaction or not in a step S108. As a result, if no loan exists, processing proceeds to the step S114 to take a normal procedure for payment.

If it is verified in the step S108 that the last loan exists, the sum of the last loan is displayed on the display 21 of the electronic purse terminal 2, a message which urges to select whether the loan is to be cleared off or not is also displayed and the owner of the IC card 1 selects either via the input unit 22 of the electronic purse terminal 2 in a step S109. If clearing is selected, the balance stored in the sum information storage 14 of the IC card 1 is read by the card reader/writer 23 in the electronic purse terminal 2 in a step S110 and is compared with the loan stored in the loan storage 61 shown in Fig. 2 in the personal information storage 34 in the center 3 by the processor 32 in a step S111.

If the balance is more than the loan, the loan is subtracted from the balance by the processor 32 and a new balance is written to the sum information storage 14 of the IC card 1 by the card reader/writer 24 in a step

S112. The loan storage 61 and the loaned date storage 62 respectively shown in Fig. 2 in the personal information storage 34 in the center 3 are reset in a step S113.

Clearing off the loan in the last transaction is finished by the above-described steps and processing proceeds to the procedure for next service. If the loan is not cleared off in the step S109 or the balance is short in the step S111, next service cannot be received, the IC card 1 is ejected from the electronic purse terminal 2 by the card controller 23 in a step S129 and the processing is finished in a step S130.

If the owner of the IC card is not a cataloged member in the step S106 or no loan exists in the step S108 even if the owner is a cataloged member when processing proceeds as far as the above-described step S113, first the contents of a variety of services such as a movie, news and sports which this system can provide are displayed on the monitor 4 and the user can select his/her desired service on the input unit 51 of the setting top box 5. For example, when a movie is selected, the titles of movies and the charge are displayed in a step S114 and the user selects the title of his/her desired movie on the input unit 52 in a step S115.

When the title is selected, the balance stored in the sum information storage 14 of the IC card 1 is read by the card reader/writer 24 and is compared with the charge of this selected movie by the processor 32 of the center 3 in a step S116. As a result, if the balance is more than or equal to the charge, the charge is subtracted from the balance by the processor 32 in a step S117, is added to the sales storage 33 in a step S118, the balance stored in the sum information storage 14 of the IC card 1 is updated by the card reader/writer 24 and the payment for the charge is finished in a step S119.

Hereby, the data of the movie selected from the movie bank 36 is read and converted by the data converter 35, is sent to the processor 32 of the center 3 and is transferred to the setting top box 5 via the communication control unit 31. The data is fetched in the setting top box 5 via the communication control unit 53, movie data is converted by the data converter 51 in a step S125 and the movie is presented on the monitor 4 in a step S126.

If the balance is less than the charge in the step S116, a message showing the balance is short is displayed on the display 21 of the electronic purse terminal 2 in a step S120. And it is checked again

whether the ID number of the user of the IC card 1 is cataloged or not in a step S121 and as a result, when it is verified that the user is a cataloged member, a message which urges the user to select whether he/she has a loan or not is displayed on the display 21 and the user is urged to select either in a step S122.

If the user selects having loan on the electronic purse input unit 22 in the step S122, the charge is added to the sales storage 33 in the center 3 in a step S123, the sum of the loan is stored in the loan storage 61 shown in Fig. 2 and the loaned date is stored in the loaned date storage 62 shown in Fig. 2 respectively in the personal information storage 34 in a step S124. In this case, the total charge is processed as the sum of the loan. Payment is finished by this procedure and the presentation of the desired movie is started in steps S125 and S126.

If the user is not a cataloged member in the step S121 or if the user selects not having loan on the electronic purse input unit 22 in the step S122 even if he/she is a cataloged member, the user cannot enjoy a movie and his/her IC card 1 is ejected from the electronic purse terminal 2 by the card controller 23 in a step S129.

When the movie is finished, a message which urges the user to select whether the service is to be finished or another movie is to be selected is displayed on the monitor in a step S127. When the user selects enjoying another movie on the input unit 52 of the setting top box 5, processing is returned to a state in which the titles of the movies and the charge are displayed on the monitor 4 in the step S114 and if the user pays the charge, he/she can enjoy another movie.

When the user selects the finish of the service on the setting top box input unit 52 in the step S127, the service is finished in a step S128 and his/her IC card 1 is ejected from the electronic purse terminal 2 by the card controller 23 in the step S129.

An IC card 1 may be provided with a loaned sum storage to collate the data of a loaned sum read from each IC card by the card reader/writer 24 with the data stored in the center 3. The total charge may be loaned and the amount in which the balance is short may be loaned. In the latter case, the balance stored in the sum information storage 14 of an IC card 1 is required to be updated.

In the above-described embodiment, in case a plurality of ID numbers in a family are grouped in the personal information storage 34 as shown in Fig. 2 (b)

and are stored in the center 3 as group information, a member of the group can clear off the loan given to another member. Therefore, the charge of the movies enjoyed by a child can be paid by his/her parent in a lump.

In the above-described embodiment, the electronic purse terminal 2 and the setting top box 5 are separate, however, the electronic purse system may be built in the setting top box.

Next, the processing in this embodiment of a case that the term of repayment is determined will be described.

Fig. 4 is a flowchart showing the basic processing for payment in this embodiment in which the term of repayment is determined and which is provided with a function for loan.

As shown in Figs. 1 and 4, when an IC card 1 is inserted into the slot of an electronic purse terminal 2 in the wait state for an input in steps S202 and S203 if the owner of the IC card 1 pays the charge of a service by electronic money, the IC card 1 is inserted by a card controller 23 in the electronic purse terminal 2 and the connection 13 of the IC card 1 is connected to a card reader/writer 24.

The electronic purse terminal 2 verifies the input of the IC card 1 in the step S203 and first checks whether the owner of this IC card 1 is a cataloged member of a center 3 or not.

That is, the ID number proper to this IC card stored in the ID number storage 11 of the IC card 1 is read by the card reader/writer 24 in a step S204 and after it is processed in a processor 25 in the electronic purse terminal 2, it is supplied to the processor 32 of the center 3 via the communication control unit 26 of the electronic purse terminal 2 and the communication control unit 31 of the center 3. Its cataloged ID number is read from an ID number storage 61 shown in Fig. 2 in a personal information storage 34 in the center 3 in a step S205 and it is checked whether the ID number is cataloged in the center 3 or not by collating the ID number read from the IC card 1 with this cataloged ID number in a step S206. If the ID number is cataloged in the center 3, a function for loan is usable, however, if it is not a cataloged member, a function for loan cannot be utilized, only a normal transaction is enabled and processing proceeds to a step S214.

If the charge of the last service is paid utilizing this function for loan of the center 3 when an

ID number is a cataloged member, clearing is required, however, in this embodiment, if the date is within the date to be repaid, further loan can be given even if the above-described charge is not cleared off.

In a step S207, the user's former transactions are checked referring to the contents of a loaned date storage 62 shown in Fig. 2 in the personal information storage 34 in the center 3 and as a result, if the user is given no loan in a step S208, processing proceeds to the step S214 for a normal procedure.

If the user is given the loan of the last charge in the step S208, the sum of the former loan is displayed on the display 21 of the electronic purse terminal 2 and the user is urged to select whether he/she clears off the loan or not in a step S209. If the balance stored in the sum information storage 14 of the IC card 1 is more than the loan, the loan can be cleared off, however, if the balance is short or if clearing is not yet performed, the user can refuse clearing. In this case, processing proceeds to the step S214.

If clearing is selected in the step S209, the balance stored in the sum information storage 14 of the IC card 1 is read by the card reader/writer 24 of the electronic purse terminal 2 in a step S210 and is

compared with the sum of the loan stored in the loan storage 61 shown in Fig. 2 in the personal information storage 34 in the center 3 by the processor 32 in a step S211. If the balance is more than the loan, the loan is subtracted from the balance by the processor 32, a new balance is written to the sum information storage 14 of the IC card 1 by the card reader/writer 24 of the electronic purse terminal 2 in the step S212 and the sum of the loan stored in the loan storage 61 shown in Fig. 2 and the loaned date stored in the loaned date storage 62 shown in Fig. 2 respectively in the personal information storage 34 in the center 3 are reset in the step S213.

Clearing of the former transaction is finished by the above-described steps and processing proceeds to a procedure for this service. If the former transaction is not cleared off in the step S209 or if the balance is short in the step S211, a new service is provided without clearing off the loan.

Next, the contents of services and the charge are displayed on the monitor 4 in the step S214 and the user selects his/her desired service on the input unit 52 of the setting top box 5 in a step S215.

When a service is selected as described above, the balance stored in the sum information storage 14 of

the IC card 1 is read by the card reader/writer 24 and sent to the processor 32 of the center 3 to compare the balance with the charge of the service in a step S216. As a result, if the balance is more than the charge, the charge is subtracted from the balance by the processor 32 in a step S217 and is added to the sales storage 33 by the processor 32 in a step S218. The balance stored in the sum information storage 14 of the IC card 1 is updated by the card reader/writer 24 of the electronic purse terminal 2 in a step S219.

Hereby, payment is finished, data is transferred to the setting top box 5 in a step S228 and service is started in a step S229.

If the balance is less than the charge in the step S216, the shortfall is displayed on the display 21 of the electronic purse terminal 2 in a step S220. The ID number is referred again and it is checked whether the number is a cataloged member or not in a step S221. As a result, if the ID number is a cataloged member, a message which urges the user to select whether the user has a loan or not is displayed on the display 21 of the electronic purse terminal 2 in a step S222.

If the user selects he/she has a loan on the input unit 22 of the electronic purse terminal 2 in a step S222, data stored in the loaned date storage 62

shown in Fig. 2 in the personal information storage 34 in the center 3 is read to check whether the user has a loan at the last time or not in a step S223 and if the user is given no loan formerly, processing proceeds to a step S225 so as to give the user loan immediately.

If the user is given loan in the step S223 and the date is within the term of repayment set by the center 3, for example 28th every month in a step S224, the charge is added to the sales storage 33 by the processor 32 of the center 3 in a step S225, and the loan storage 61 shown in Fig. 2 and the loaned date storage 62 shown in Fig. 2 respectively in the personal information storage 34 are updated in a step S226.

Payment by loan is finished by this procedure, processing proceeds to the step S228 and service is started in the step S228.

In this case, the total charge may be loaned or only the shortfall may be loaned.

If the term of repayment is over, a message for informing the user that the term of repayment is over is displayed on the display 21 of the electronic purse terminal 2 in a step S227, the user cannot receive service as a non-cataloged member or the user who selects that he/she has no loan on the input unit 22 of the electronic purse terminal 2 and the IC card 1 is

ejected from the electronic purse terminal 2 by the card controller 23 in a step S232.

When the service is finished, a message which urges the user to select whether service is to be finished or a new service is to be provided is displayed on the monitor 4 in a step S230. If the user selects that he/she receives a new service on the input unit 52 of the setting top box 5, processing is returned to a state in which the contents of services and the charge are displayed on the monitor 4 in the step S214 and when payment is made, the user can receive a new service.

If the user selects that service is to be finished on the input unit 52 of the setting top box 5 in the step S230, service is finished in the step S231 and the IC card 1 is ejected from the electronic purse terminal 2 by the card controller 23 in the step S232. Hereby, a series of processing is finished in a step S233.

In this embodiment, repayment is set to payment in monthly installments and charges can be loaned many times within the term of repayment, however, a repayment term storage may be provided to the personal information storage 34 in the center 3 and it may be set that charges can be loaned many times within the term of

repayment set as the number of days from the day of the first loan.

Next, the processing in this embodiment in case the upper limit of a loan is determined will be described.

Fig. 5 shows a concrete example of the personal information storage 34 shown in Fig. 1 in which the upper limit of a loan is stored, a reference number 60 denotes the ID number storage, 71 denotes a loan upper limit storage, 61 denotes the loan storage and 62 denotes the loaned date storage.

Fig. 6 is a flowchart showing the basic processing when payment is made in this embodiment provided with a function for loan the upper limit of which is determined and the upper limit of a loan is stored in the loan upper limit storage 71 in the personal information storage 34 shown in Fig. 5.

In this case, the processing shown in the steps S201 to S 213 shown in Fig. 4 is also the same, hereby the loan in the former transaction is cleared off and after the contents of services and the charge are displayed on the monitor 4 in a step S301, the user selects his/her desired service on the input unit 52 of the setting top box 5 in a step S302.

When the service is selected, the balance stored in the sum information storage 14 of the IC card 1 is read by the card reader/writer 24 in the electronic purse terminal 2 and sent to the processor 32 of the center 3 to compare the balance with the charge in a step S303. As a result, if the balance is more than the charge, the charge is subtracted from the balance by the processor 32 in a step S304 and the balance stored in the sum information storage 14 of the IC card 1 is updated by the card reader/writer 24 in a step S305. The charge is added to the sales storage 33 by the processor 32 in a step S306.

Hereby, payment is finished, the data of the selected service is transferred to the setting top box 5 in a step S315 and service is started in a step S316.

If the balance is less than the charge in the step S303, a message showing the balance is short is displayed on the display 21 of the electronic purse terminal 2 in a step S307. It is checked again whether the user is a cataloged member or not in a step S308 and if it is verified that the user is a cataloged member, a message which urges the user to select whether he/she has a loan or not is displayed on the display 21 of the electronic purse terminal 2 in a step S309.

If the user selects that he/she has a loan on the input unit 22 of the electronic purse terminal 2, the charge of the service is added to the present sum of the loan stored in the loan storage 61 shown in Fig. 5 in the personal information storage 34 in the center 3 to calculate the new sum of the loan in a step S310. This new sum of the loan and the upper limit of the loan stored in the loan upper limit storage 61 shown in Fig. 5 in the personal information storage 34 are compared by the processor 32 of the center 3 in a step S311 and as a result, if the loan is less than the upper limit, the charge of the service is added to the sales storage 33 by the processor 32 in a step S312. The sum of the loan stored in the loan storage 61 shown in Fig. 5 in the personal information storage 34 in the center 3 is updated in a step S313.

Payment is finished by the above-described procedure and service is started in the step S315.

If the user is not a cataloged member in the step S308 or if the user selects that he/she has no loan on the input unit 22 in the step S309 even if he/she is a cataloged member, he/she cannot receive service and his/her IC card 1 is ejected from the electronic purse terminal 2 by the card controller 23 in a step S319.

If the user's loan exceeds the upper limit in the step S311, a message showing his/her loan exceeds the upper limit is displayed on the display 21 of the electronic purse terminal 2 in the step S314 and his/her IC card 1 is ejected from the electronic purse terminal 2 by the card controller 23 in the step S319.

When service is finished, a message which urges the user to select whether service is to be finished or a new service is to be provided is displayed on the monitor 4 in the step S317. When the user selects the provision of a new service on the input unit 52 of the setting top box 5, processing is returned to a state in which the contents of services and the charge are displayed on the monitor 4 in the step S301 and when payment is finished, the user can receive service.

If the user selects the finish of service on the input unit 52 of the setting top box 5, service is finished in the step S318 and his/her IC card 1 is ejected from the electronic purse terminal 2 by the card controller 23 in the step S319. Hereby, a series of processing is finished in a step S320.

In this embodiment, the upper limit of a loan can be arbitrarily set by providing the loan upper limit storage 71 shown in Fig. 5 to the personal information storage 34, however, the upper limit of any user's loan

of the center may be equal without this loan upper limit storage 71.

A storage for storing the term of repayment and the number of times of loan may be provided in the personal information storage 34 in addition to the upper limit of a loan to adjust the sum of a loan.

In this embodiment, the total charge is paid by loan, however, if the user does not want to pay the total charge by loan, only the shortfall of the balance may be paid by loan.

The electronic purse loan system in case data from the center such as a movie is received via the setting top box is described above, however, a case that the contents of a game are received via the setting top box may be also considered. In this case, the charge may be charged every game independent of the time or the charge may be charged every fixed time in which games are provided. In the former system, a function for loan can be utilized at the time of clearing as the case of a movie. In the latter system, clearing is automatically performed every fixed time in which games are provided and only if the balance stored in an IC card is short, a game is temporarily suspended and a function for loan is executed.

As described above, even if the balance stored in an IC card is short when a game is provided based upon payment by the fixed time, the game can be continued owing to a function for loan.

Next, an embodiment in case the present invention is used for a POS register terminal in a supermarket and others will be described.

Fig. 7 is a block diagram showing a second embodiment of an electronic purse loan system according to the present invention in case it is used for such a POS terminal. A reference number 8 denotes a POS terminal, 81 denotes a display, 82 denotes a POS register keyboard input unit, 83 denotes a card controller and 84 denotes a card reader/writer. A reference number 85 denotes a processor, 86 denotes a communication control unit, 87 denotes a sales storage, 88 denotes a personal information storage and an IC card 1 is the same as in the embodiment shown in Fig. 1.

Fig. 8 is a flowchart showing a concrete example of the basic processing in this embodiment.

When the owner of an IC card 1 inserts the IC card 1 into the slot of the POS terminal 8 which is in the wait state for input in steps S402 and S403 to pay the charge of service by electronic money, it is verified in a step S403 that the IC card 1 is inserted.

When it is verified that the IC card 1 is inserted, it is first checked whether the owner of the IC card 1 is a cataloged member of the POS terminal 8 or not.

Therefore, the ID number proper to the IC card stored in the ID number storage 11 of the IC card 1 is read by the card reader/writer 84 in the POS terminal 8 in a step S404 and is supplied to the processor 85 of the POS terminal 8. Next, the cataloged ID number is read from an ID number storage 60 in the personal information storage 88 (provided with the same constitution as the personal information storage 34 shown in Fig. 2 in this embodiment) in the POS terminal 8 in a step S405 and it is checked by collating the ID number read from the IC card with this ID number whether the ID number is cataloged in the POS terminal 8 or not in a step S406.

Hereby, if it is verified that the ID number is cataloged, payment by the loan system is enabled, however, if the ID number is not cataloged, the owner of the IC card cannot utilize the loan system, only a normal transaction by electronic money is enabled and processing proceeds to a step S414.

Only if a cataloged member paid the charge of the last service utilizing the loan function of the POS

terminal 8, he/she cannot receive this service without clearing. Therefore, the last transaction is checked in a step S408 by referring to the contents stored in a loan storage 61 shown in Fig. 2 and a loaned date storage 62 shown in Fig. 2 respectively in the personal information storage 88 in the POS terminal 8 in a step S407. As a result, if the owner has no loan, processing proceeds to a step S414 for normal payment.

If it is verified in the step S408 that the owner had a loan at the last time, the sum of the loan at that time is displayed on the display 81 of the POS terminal 8, a message which urges the owner of the IC card 1 to select whether the loan is to be cleared off or not is displayed there and he/she selects either on the POS register keyboard input unit 82 in a step S409. If the owner selects clearing, the balance stored in the sum information storage 14 of the IC card 1 is read by the card reader/writer 84 in the POS terminal 8 in a step S410 and is compared with the sum of the loan stored in the loan storage 61 shown in Fig. 2 in the personal information storage 34 by the processor 85 in a step S411.

If the balance is more than the sum of the loan, the sum of the loan is subtracted from the balance by the processor 85 and a new balance is written to the sum

information storage 14 of the IC card 1 by the card reader/writer 84 in a step S412. The loan storage 61 shown in Fig. 2 and the loaned date storage 62 shown in Fig. 2 respectively in the personal information storage 88 in the POS terminal 8 are reset in a step S413.

Clearing off a loan in the last transaction is finished by the above-described procedure and a procedure for this service is started. If a loan is not cleared off in the step S409 or the balance is short in the step S411, the owner cannot receive service, his/her IC card 1 is ejected from the POS terminal 8 by the card controller 83 in a step S426 and the processing is finished in a step S427.

If the owner is not a cataloged member in the step S406 or if he/she has no loan even if he/she is a cataloged member when processing proceeds to the above-described step S413, first the contents of this service and the charge are displayed on the display 81 of the POS terminal 8 in the step S414. The balance stored in the sum information storage 14 of the IC card 1 is read by the card reader/writer 84 and is compared with the charge of this service by the processor 85 in a step S415. As a result, if the balance is more than or equal to the charge, the charge is subtracted from the balance by the processor 85 in a step S416, the charge is added

to the sales storage 87 in a step S417, the balance stored in the sum information storage 14 of the IC card 1 is updated by the card reader/writer 84 in a step S418, a message showing the finish of payment is displayed on the display 81 of the POS terminal 8 in a step S424 and payment is finished in a step S425.

If the balance stored in the IC card 1 is less than the charge of this service in a step S421, a message showing the balance is short is displayed on the display 81 of the POS terminal 8 in a step S419. It is checked again whether the ID number of the IC card 1 is cataloged or not in a step 420. As a result, if the ID number is cataloged, a message which urges the owner to select whether he/she has a loan or not is displayed on the display 81 in the step S421.

If the owner selects he/she has a loan on the POS register input unit 82 in the step S421, the charge is added to the sales storage 87 in the POS terminal 8 in a step S422, the sum of the loan is stored in the loan storage 61 shown in Fig. 2 in the personal information storage 88 and the loaned date is stored in the loaned date storage 62 shown in Fig. 2 in the personal information storage 88 in a step S423.

The data of the sum of a loan may be stored in both the POS terminal 8 and an IC card 1 by providing a

loaned sum storage to the IC card 1 and storing the sum of a loan in the IC card 1 by the card reader/writer 84. The total charge may be loaned or the shortfall of a balance may be loaned.

A message showing payment is finished is displayed on the display 81 of the POS terminal 8 by this procedure in the step S424 and payment is finished in the step S425. A non-cataloged member in the step S420 or the user who selects he/she has no loan on the POS register input unit 82 in the step S421 cannot pay the charge of this service and his/her IC card 1 is ejected from the POS terminal 8 by the card controller 83 in the step S426. In this case, the user is required to stop shopping at a supermarket or to take a procedure for payment again after he/she pays the required sum in his/her account for his/her IC card.

When the payment of the charge is finished, the IC card 1 is ejected from the POS terminal 8 by the card controller 83 in the step S426.

Electronic money information read from an IC card 1 is supplied to the sales storage 87 in the POS terminal 8, however, it may be transmitted to a bank and others via the communication control unit 86.

In this embodiment, the upper limit of a loan and the term of repayment may be also set. This

embodiment may be constituted so that loan and clearing off a loan are enabled in any POS terminal at the chain stores of a convenience store or a gas station by providing a personal information storage to the center. In the case, personal information such as the sum of a loan and electronic money information are transmitted to the center or a bank via the communication control unit 86.

Next, an embodiment in case the present invention is utilized for an automatic ticket examiner used for payment of the fare of a train or a bus will be described.

Fig. 9 is a block diagram showing a third embodiment of an electronic purse loan system according to the present invention in case the present invention is utilized for such an automatic ticket examiner. A reference number 1 denotes an IC card, 9 denotes an automatic ticket examiner for an electronic purse, 10 denotes a center, 91 denotes a display and 92 denotes a station code storage. A reference number 93 denotes a card controller, 94 denotes a card reader/writer, 95 denotes a processor, 96 denotes a communication control processor and 97 denotes a gate controller. A reference number 101 denotes a communication control unit, 102 denotes processor, 103 denotes a sales storage, 104

denotes a personal information storage and 105 denotes fare data.

Fig. 10 shows a concrete example of a personal information storage for the automatic ticket examiner shown in Fig. 9, a reference number 110 denotes the personal information storage for the automatic ticket examiner, 111 denotes an entraining station code storage and the same reference number is assigned to a portion corresponding to that in the above-described drawings.

Fig. 11 is a flowchart showing the basic processing in this embodiment.

When the owner of an IC card 1 inserts the IC card 1 into the slot for an IC card of the automatic ticket examiner 9 for an electronic purse which is in the wait state for input in steps S502 and S503 as shown in Figs. 9 and 11 to pay a fare by electronic money, the connection 13 of the IC card 1 is connected to the card reader/writer 94 by the card controller 93 in a step S503.

When the IC card 1 is inserted, the ID number is first read from the IC card 1 to check whether the user entrains or detrains.

That is, after the ID number proper to this IC card 1 stored in the ID number storage 13 of the IC card 1 is read by the card reader/writer 94 and is processed

by the processor 95, it is supplied to the processor 102 of the center 10 via the communication control units 96 and 101 in a step S504. Its ID number cataloged in an ID number storage 60 shown in Fig. 10 in the personal information storage 104 in the center 10 if any is read in a step S505 and the ID number read from the IC card 1 is compared with this ID number in a step S506. As a result, if the ID number of the IC card 1 is not cataloged, the owner of this IC card 1 is an incoming passenger, processing proceeds to an entraining flowchart shown in Fig. 12 (a) and if the ID number of this IC card 1 is cataloged, the owner of this IC card 1 is an outgoing passenger or a passenger who had a loan at the last time.

Further, to judge whether a user the ID number whose is cataloged detrains or he/she has a loan, the contents stored in a loan storage 61 shown in Fig. 10 in the personal information storage 104 in the center 10 are read in a step S507 and it is judged in a step S508 whether the user has a loan or not based upon the contents. If the user has a loan, the processing for clearing is performed and as the user is an outgoing passenger except it, processing proceeds to a detraining flowchart for paying a fare shown in Fig. 12 (b).

If the user has a loan, the balance is read from the sum information storage 14 of the IC card 1 by the card reader/writer 94 to clear off the loan automatically and is supplied to the processor 102 of the center 10 via the communication control processors 96 and 101 in a step S509.

The sum of the loan stored in the loan storage 61 shown in Fig. 10 in the personal information storage 104 and the balance are compared in a step S510, if the balance is more than or equal to the loan, the sum of the loan is subtracted from the balance, a new balance is written to the sum information storage 14 of the IC card 1 by the card reader/writer 94 in a step S511, the personal information storage 104 in the center 10 is reset and clearing is finished in a step S512.

If the balance is less than the loan in the step S510, a gate for entrance is shut by the gate controller 97 of the automatic ticket examiner 9 for an electronic purse in a step S513, the IC card 1 is ejected by the card controller 93 in a step S514 and the user cannot enter the yard of a station in a step S515.

Fig. 12 (a) is a flowchart showing a concrete example of the basic processing for entraining in this third embodiment and Fig. 12 (b) is a flowchart showing

a concrete example of the basic processing for detrainment.

In the case of entraining, its ID number read from the ID number storage 11 of the IC card 1 is cataloged in the ID number storage 60 shown in Fig. 10 in the personal information storage 104 in the center 10 in a step S601 as shown in Fig. 12 (a). Similarly, its station code stored in the station code storage 92 in the automatic ticket examiner 9 for an electronic purse is written to the entraining station code storage 111 shown in Fig. 10 in a step S602. The gate for entrance is opened by the gate controller 97 in a step S603, the IC card 1 is ejected from the automatic ticket examiner 9 for an electronic purse by the card controller 93 in a step S604 and the processing for entrance is finished in a step S605. However, at this time, no payment shall be made.

In the case of detrainment, the contents stored in the entraining station code storage 111 shown in Fig. 10 in the personal information storage 104 in the center 10 are read in a step S606 as shown in Fig. 12 (b) and similarly, its detraining station code is read from the station code storage 92 in the automatic ticket examiner 9 for an electronic purse in a step S607. The charge corresponding to its entrained section is read from fare

data stored in the center 10 in a step S608 and the charge is displayed on the display 91 of the automatic ticket examiner 9 for an electronic purse in a step S609.

Data is read from the sum information storage 14 of the IC card 1 by the card reader/writer 94 to compare with the above-described charge in a step S610. As a result, if the balance is more than the charge, processing proceeds to processing for normal payment and if the balance is less than the charge, processing proceeds to processing for loan.

In processing for normal payment, the charge is subtracted from the balance in a step S611, the charge is added to the sales storage 103 in the center 10 in a step S612 and a new balance is written to the sum information storage 14 in a step S613. Hereby, payment is finished, the gate is opened by the gate controller 97 in a step S618, the IC card 1 is ejected from the automatic ticket examiner 9 for an electronic purse by the card controller 93 in a step S619 and the processing is finished in a step S620.

If the balance is short in the step S610, loan is automatically made. That is, a message showing the balance is short is displayed on the display 91 of the automatic ticket examiner 9 for an electronic purse in a

step S614 and the charge is added to the sales storage 103 in a step S615. In this case, the total charge is loaned. The ID number of the IC card 1 is written to the ID number storage 60 shown in Fig. 10 in the personal information storage 104 in the center 10, the sum of the loan is written to the loan storage 61 shown in Fig. 10 and the loaned date is written to the loaned date storage 62 shown in Fig. 10 in a step S616. Hereby, the processing for loan is finished, the gate is opened in a step S617, then the IC card 1 is ejected in a step S618 and the processing is finished in a step S619.

So far a case that loan is made once is described, however, in this embodiment loan may be made plural times by setting the upper limit of a loan and the term of repayment or the times of loan in the personal information storage 104. The total charge may be loaned or only the shortfall may be loaned. Further, data exchange between the IC card 1 and the automatic ticket examiner 9 for an electronic purse may be made without connection.

Fig. 13 shows a concrete example in case electronic money information of the sum of a loan is stored in the above-described IC card 1. A reference number 15 denotes a loan information storage. In this

case, as personal information such as the sum of a loan is stored in an IC card, the security of electronic money information can be secured.

CLAIMS

1. An electronic purse loan system, comprising:
an IC card provided with an ID number for
storing electronic money information;

an electronic purse terminal comprising an IC
card reading/writing means for reading information
stored in said IC card or writing information to said IC
card, an input means for inputting a numeric value and
others and a first communication control means for
sending or receiving data via a public telephone
network; and

an information center comprising a personal
information storage means for storing the ID number of
said IC card and the information of the sum, a collation
means for collating the ID number of said IC card and
the information of the sum stored in said IC card with
its ID number and the information of the sum stored in
said personal information storage means, a data bank
means for storing data such as a movie and a second
communication control means for sending or receiving
data via a communication line such as a public telephone
network, wherein:

when said information center reads data stored
in said data bank means, said electronic purse terminal
subtracts electronic money information equivalent to the

charge of said data from data stored in said IC card using said IC card reading/writing means and sends said electronic money information to said information center via said first and second communication control means.

2. An electronic purse loan system according to Claim 1, wherein:

if electronic money information stored in said IC card is less than the charge of said data when said information center reads data stored in said data bank means, the ID number is verified by collating its ID number read from said IC card by said collation means; and

only if the user selects loan using said input means, the total or a part of the charge of said data is stored as the information of the sum in said personal information storage means.

3. An electronic purse loan system according to Claim 1, wherein:

if the information of the sum is already stored in said personal information storage means when said information center reads data from said data bank means, said electronic purse terminal subtracts electronic money information equivalent to the information of the sum from data stored in said IC card using said IC card reading/writing means;

then, electronic money information equivalent to the charge of said data is subtracted from data stored in said IC card; and

this electronic money information is sent to said information center via said first and second communication control means.

4. An electronic purse loan system, comprising:
an IC card provided with an ID number for storing electronic money information;

an electronic purse terminal comprising an IC card reading/writing means for reading information stored in said IC card or writing information to said IC card, an input means for inputting a numeric value and others and a first communication control means for sending or receiving data via a communication line such as a public telephone network; and

an information center comprising a personal information storage means for storing the ID number of said IC card, the information of the sum and loaned date information, a collation means for collating with its ID number, the information of the sum and loaned date information stored in said personal information storage means, a data bank means for storing data such as a movie and a second communication control means for

sending or receiving data via a public telephone network, wherein:

when said information center reads data stored in said data bank means, said electronic purse terminal subtracts electronic money information equivalent to the charge of said data from data stored in said IC card using said IC card reading/writing means; and

said electronic purse terminal sends said electronic money information to said information center via said first and second communication control means.

5. An electronic purse loan system according to Claim 4, wherein:

if electronic money information stored in said IC card is less than the charge of data when said information center reads data stored in said data bank means, the ID number is verified by collating its ID number read from said IC card by said collation means; and

only if the user selects loan using said input means, the total or a part of the charge of said data is stored as the information of the sum in said personal information storage means.

6. An electronic purse loan system according to Claim 4, wherein:

if the information of the sum is already stored in said personal information storage means when said information center reads data from said data bank means, it is checked whether loaned date information stored in said personal information storage means is within the term of repayment or not by said collation means;

if the loaned date is within the term, the total or a part of the charge of said data is stored as the information of the sum in said personal information storage means;

in the meantime, if the loaned date is over the term of repayment, said electronic purse terminal subtracts electronic money information equivalent to said information of the sum from data stored said IC card using said IC card reading/writing means;

then, said electronic purse terminal subtracts electronic money information equivalent to the charge of said data from data stored in said IC card; and

said electronic purse terminal sends this electronic money information to said information center via said first and second communication control means.

7. An electronic purse loan system, comprising:
an IC card provided with an ID number for storing electronic money information;

an electronic purse terminal comprising an IC card reading/writing means for reading information stored in said IC card or writing information to said IC card, an input means for inputting a numeric value and others and a first communication control means for sending or receiving data via a communication line such as a public telephone network; and

an information center comprising a personal information storage means for storing the ID number of said IC card, the information of the sum and the information of the upper limit of a loan, a collation means for collating with the ID number, the information of the sum and the information of the upper limit of a loan stored in said personal information storage means, a data bank means for storing data such as a movie and a second communication control means for sending or receiving data via a public telephone network, wherein

when said information center reads data stored in said data bank means, said electronic purse terminal subtracts electronic money information equivalent to the charge of said data from data stored in said IC card using said IC card reading/writing means; and

said electronic purse terminal sends said electronic money information to said information center via said first and second communication control means.

8. An electronic purse loan system according to Claim 7, wherein:

if electronic money information stored in said IC card is less than the charge of said data when said information center reads data stored in said data bank means, the ID number is verified by collating its ID number read from said IC card by said collation means; and

only if the user selects loan using said input means, the total or a part of the charge of said data is stored as the information of the sum in said personal information storage means.

9. An electronic purse loan system according to Claim 7, wherein:

if the information of the sum is already stored in said personal information storage means when said information center reads data stored in said data bank means, it is checked whether said information of the sum stored in said personal information storage means is within the upper limit of a loan or not by said collation means;

if the information of the sum is within the upper limit, the total or a part of the charge of said data is stored as the information of the sum in said personal information storage means;

in the meantime, if the information of the sum exceeds the upper limit, said electronic purse terminal subtracts electronic money information equivalent to said information of the sum from data stored in said IC card using said IC card reading/writing means;

then, said electronic purse terminal subtracts electronic money information equivalent to the charge of said data from data stored in said IC card; and

said electronic purse terminal sends this electronic money information to said information center via said first and second communication control means.

10. An electronic purse loan system, comprising:

an IC card provided with an ID number for storing electronic money information; and

a terminal comprising an IC card reading/writing means for reading information stored in said IC card or writing information to said IC card, an input means for inputting a numeric value and others, a personal information storage means for storing the ID number of said IC card and the information of the sum and a collation means for collating with the ID number and the information of the sum stored in said personal information storage means, wherein:

when the payment of a commercial transaction is made, said terminal subtracts electronic money information equivalent to the sum to be paid for said commercial transaction from data stored in said IC card using said IC card reading/writing means.

11. An electronic purse loan system according to Claim 10, wherein:

if electronic money information stored in said IC card is less than the said sum to be paid, the ID number is verified by collating its ID number read from said IC card by said collation means; and

only if the user selects loan using said input means, the total or a part of said sum to be paid is stored as the information of the sum in said personal information storage means.

12. An electronic purse loan system according to Claim 10, wherein:

if the information of the sum is already stored in said personal information storage means, said terminal subtracts electronic money information equivalent to said information of the sum from data stored in said IC card using said IC card reading/writing means; and

then, said terminal subtracts electronic money information equivalent to said charge to be paid from data stored in said IC card.

13. An electronic purse loan system, comprising:

an IC card provided with an ID number for storing electronic money information;

an automatic ticket examiner provided with an IC card reading/writing means for reading information stored in said IC card or writing information to said IC card and a first communication control means for sending or receiving data via a public telephone network; and

an information center provided with a personal information storage means for storing the ID number of said IC card and the information of the sum, a collation means for collating with the ID number and the information of the sum stored in said personal information storage means and a second communication control means for sending or receiving data via a public telephone network, wherein:

said automatic ticket examiner subtracts electronic money information equivalent to a fare from data stored in said IC card using said IC card reading/writing means if the payment of said fare is made by said automatic ticket examiner; and

said automatic ticket examiner sends said electronic money information to said information center via said first and second communication control means.

14. An electronic purse loan system according to Claim 13, wherein:

if electronic money information stored in said IC card is less than said fare, said information center collates its ID number read from said IC card using said collation means; and

only if said ID number is verified, the total or a part of said fare is stored as the information of the sum in said personal information storage means.

15. An electronic purse loan system according to Claim 13, wherein:

if the information of the sum is already stored in said personal information storage means, said automatic ticket examiner subtracts electronic money equivalent to said information of the sum from data stored in said IC card using said IC card reading/writing means;

then, said automatic ticket examiner subtracts electronic money information equivalent to said fare from data stored in said IC card; and

said automatic ticket examiner sends this electronic money information to said information center via said first and second communication control means.

16. An electronic purse loan system, comprising:

an IC card comprising a sum information storage for storing electronic money information, a loan information storage for storing electronic money information equivalent to the sum of a loan and an ID number storage for storing an ID number; and

a terminal comprising an IC card reading/writing means for reading information stored in said IC card or writing information to said IC card, an input means for inputting a numeric value and others, a personal information storage means for storing the ID number of said IC card and a collation means for collating the ID number of said IC card with the ID number stored in said personal information storage means, wherein:

when the payment of a commercial transaction is made, said terminal subtracts electronic money information equivalent to the sum to be paid for the commercial transaction from data stored in the sum information storage of said IC card using said IC card reading/writing means.

17. An electronic purse loan system according to Claim 16, wherein:

if electronic money information stored in said IC card is less than said sum to be paid, said terminal collates its ID number read from said IC card using said collation means so as to check said ID number; and

only if the user selects loan using said input means, the total or a part of said sum to be paid is stored as the sum of a loan in said loan information storage.

18. An electronic purse loan system according to Claim 16, wherein:

if the sum of a loan is already stored in said loan information storage, said terminal subtracts electronic money information equivalent to said sum of the loan from data stored in said sum information storage of said IC card using said IC card reading/writing means; and

then, said terminal subtracts electronic money information equivalent to said charge to be paid from data stored in said sum information storage.

19. An electron purse loan system substantially as herein described with reference to and as illustrated in Figs. 1 to 6, or Figs. 7 and 8, or Figs. 9 to 12, or Fig. 13 of the accompanying drawings.



The Patent Office

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Application No: GB 9615999.1
Claims searched: All

Examiner: Mr. G. Nicholls
Date of search: 28 October 1996

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): G4T (TAE TAX TBA TBX) G4V (VAK)

Int CI (Ed.6): G07B 15/00 15/02 G07F 7/08

Other: ONLINE : WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
P,X	EP 0666549 A1 (MASTERCARD) Whole document	10
X	US 4757186 (HEBERLE) Whole document	10
X	US 3559175 (POMEROY) See especially Abstract	10
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